TELETYPE COMPATIBLE CRT TERMINAL MARKET

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UNITED STATES, West Coast
2471 East Bayshore Blvd.
Suite 600
Palo Alto, California 94303
(415) 493-1600
Telex 171407

[S]TATES, East Coast
[Pl]aza West-1
[...]ok, New Jersey 07662
[...]9471

[K]INGDOM
[Eu]rope
[Ho]use
[...]ick High Road
[...]4 5TF

[...]

ervice Company, Ltd.
[Bldg], No. 12-7 Kita Aoyama
[...]-Ku

[Australi]a
7-9 Merriwa Street
[Go]rdon N.S.W. 2072

TELETYPE COMPATIBLE CRT TERMINAL MARKET

Prepared For:

INTERNATIONAL BUSINESS MACHINES CORPORATION

SYSTEMS COMMUNICATION DIVISION

MARCH 1979

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TELETYPE COMPATIBLE CRT TERMINAL MARKET

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TELETYPE COMPATIBLE CRT TERMINAL MARKET

LIST OF EXHIBITS

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I INTRODUCTION

I INTRODUCTION

A. PURPOSE AND SCOPE

- This report was prepared by INPUT as a custom study for IBM Systems Communication Division, Kingston, New York.

- It is an update and in-depth extension of a previous study done by INPUT for IBM in March 1978, examining key areas of the CRT terminal market.

- The objective of this study is to determine the size and growth of the Teletype compatible, ASCII asynchronous CRT terminal market by interviewing the leading vendors of this type of equipment and aggregating their non-proprietary shipment data for 1978 and 1979.

- Additional information was sought concerning:

    - Features of shipped systems.

    - Order size and pricing structure (discounts).

    - Sales percentage to end users or OEM s.

    - Service policies.

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B.   RESEARCH AND METHODOLOGY

- This study began with an on-site planning meeting between IBM Systems Communication Division staff and INPUT staff in Kingston, New York.

- A questionnaire was developed by INPUT and approved by IBM Systems Communication Division to be used as the basis for interviewing the major Teletype compatible CRT vendors.

- Results of these primary interviews were verified by checking logical consistency of reported figures, comparing various published data, and with supplementary interviews with industry knowledgeable sources.

- Results have been aggregated and shuffled in such a way as to preserve anonymity and confidentiality of sources. In particular, it should be noted that respondents referred to as A,B,C, etc., are shuffled from one exhibit to the next.

- All conclusions should be construed to be the best opinion of INPUT, based on the cumulative effect of the data and analysis described above.

- Chapter III is the substance of the oral presentation of findings as delivered to IBM staff at White Plains on March 16, 1979, and constitutes the major portion of the final report of this study.

II EXECUTIVE SUMMARY

II   EXECUTIVE SUMMARY

A.   FINDINGS

- The market for Teletype compatible, ASCII asynchronous CRT terminals grew from shipments of 133,000-189,000 units in 1977, to 210,000-290,000 units in 1978. The higher end of the range includes shipments from DEC, H-P, and Data General.

- On the same basis, shipments for 1979 are projected at 337,000-452,000 units. Again the higher end of the range includes shipments from DEC, H-P, and Data General.

- These figures represent a growth rate in units of 53% for 1977-1978, and 55% for 1978-1979.

- About two-thirds of the 1977 shipments were accounted for by the "dumb," or conversational variety of terminals. The other one-third were of the "smart," or editing variety.

- This ratio dropped to 58% dumb and 42% smart in 1978, and is expected to reverse to 46% dumb and 54% smart in 1979.

- However, the dumb category shows a rapid growth pattern at the high end (with features), growing from 90,000 units in 1977, to 137,500 units in 1978, to 185,000 units in 1979.

- This represents an average annual growth rate (AAGR) of 44%.

- However, all of the categories appear to be moving toward the smart end of the spectrum, opening up a new category of "semi-dumb" terminals, comprising a dumb terminal with a numeric keypad and character insert/delete capabilities as standard features.

- Similarly, the smart category appears to be moving toward multiple pages of memory and a full-blown set of features as standard equipment, while the middle range is being squeezed into one category or the other, ceasing to exist as a separate entity.

- The predominant reason for this shift is the availability of an electronics package which provides the additional features at little additional cost.

- These factors are also evident in the shift of customer base from 75% OEM and distributor sales in 1977, to almost 90% OEM and distributor sales now.

- A large number of new models are expected to be introduced in 1979, as vendors upgrade and consolidate their product lines.

- Most of these new models are expected to be in the smart category, although some of the larger vendors are expected to introduce new models at the dumb end.

- OEM discount schedules run from 10-35%, with negotiated terms very common for large quantities (over 100 or 500 units/year).

- The typical contract quantity has moved up to the 25-50 units/year range for smaller vendors and customers, while larger vendors and customers are in the 200-500 units/year range.

- Smaller quantities are almost entirely obtained by users and systems houses via distributors, with a two or three tier distributor network quite common.

- Most OEM sales do not include maintenance, since larger OEM customers prefer to offer maintenance themselves and smaller customers tend to obtain terminals from a vendor that can offer single source maintenance for all systems components.

- In lieu of maintenance contracts, some vendors are promoting the sale of one or two "spares" per 25 terminals, and recommend that defective terminals be returned directly to the factory or depot for service.

III SHIPMENTS OF TELETYPE COMPATIBLE
CRT TERMINALS

III   SHIPMENTS OF TELETYPE COMPATIBLE CRT TERMINALS

A.   INTRODUCTION

- Subject findings and conclusions of this study, as presented orally to the IBM staff in White Plains on March 16, 1979, are contained in the following section.

- Definitions and the methodology used in this study are shown in Appendix A.

B.   COMMENTS ON THE EXHIBITS

- Exhibit III-1 lists all of the manufacturers who contributed information for this study.

  - Hazeltine was unable to participate during the time frame of the study, and all information concerning their products and shipments has been derived from other sources.

  - All other major manufacturers are represented.

- When respondent comments are cited, identities of individual respondents have been shuffled to preserve privacy.

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EXHIBIT III-1

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LIST OF VENDORS INTERVIEWED

- APPLIED DIGITAL DATA SYSTEMS

- BEEHIVE INTERNATIONAL

- DATA GENERAL

- HEWLETT-PACKARD

- INFOTON

- LEAR SIEGLER

- PERKIN-ELMER

- SOROC TECHNOLOGY

- TEC INC.

- TELERAY

- TELETYPE

- Thus "Respondent A," for example, does not refer to the same company on each of the exhibits.

- Exhibit III-2 presents methodology and caveats relating to all of the market size and growth exhibits.

  - Additional comments appear in Appendix A-1.

- In 1977, there were no shipments of class IL terminals by non-respondents, as shown in Exhibit III-3.

- The study of the CRT terminal market done last year by INPUT did not include shipments by Digital Equipment Corporation, Data General, or Hewlett-Packard. These additional figures are included in the totals in this study. They are excluded from the totals shown in parentheses for purposes of comparability.

- Exhibit III-4 reports what respondents feel is the 1978 ratio of dumb to smart terminals, and is similar to the actual data for 1977.

  - A later exhibit will show that it overestimates the penetration of dumb terminals.

- Exhibit III-5 presents comments on the following exhibit.

- Exhibit III-6 was derived in the same manner as the corresponding exhibit for 1977.

  - Note the large growth (almost double) in classes IH and 2/3.

  - Note also the entry of the Hazeltine 1400 into class IL.

- Exhibit III-7 presents comments on the Derived Market Size In 1979.

EXHIBIT III-2

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METHODOLOGY — DERIVED MARKET SIZE

TELETYPE COMPATIBLE CRT TERMINALS

- CONTRIBUTION OF SYSTEM MANUFACTURERS
  (DIGITAL EQUIPMENT CORP., DATA GENERAL,
  AND HEWLETT-PACKARD) LARGELY UNKNOWN

- AT LEAST 50% CAPTIVE SALES (CRTs ON OWN
  SYSTEMS)

- IF FULLY CREDITED, CAN INFLATE MARKET
  TOTALS BY 30%

- THEREFORE MARKET SIZE CALCULATED BOTH
  INCLUDING AND EXCLUDING DIGITAL EQUIPMENT
  CORP., DATA GENERAL AND HEWLETT-PACKARD

- IBM CRTs ARE EXCLUDED FROM ALL FIGURES

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EXHIBIT III-3

DERIVED MARKET SIZE, 1977:

TELETYPE COMPATIBLE CRT TERMINALS

CATEGORY	CAPABILITY LEVEL			TOTAL
	IL	IH	2/3	
UNIT SHIPMENTS BY RESPONDENTS	27,000	36,000	48,000	111,000
ESTIMATED UNIT SHIPMENTS BY NON-RESPONDENTS	-	54,000 (14,000)	24,000 (8,000)	78,000 (22,000)
TOTAL	27,000 (27,000)	90,000 (50,000)	72,000 (56,000)	189,000 (133,000)

( ) = NO ALLOWANCE FOR DIGITAL EQUIPMENT CORP., DATA
        GENERAL, AND HEWLETT-PACKARD

EXHIBIT III-4

RESPONDENT OPINION OF DUMB/SMART RATIO

OF SHIPMENTS, 1978

RESPONDENT	PERCENT DUMB (IL+IH)	PERCENT SMART (2+3)
A	58%	42%
B	70	30
C	80	20
D	70	30
E	N/C	N/C
F	70	30
G	67	33
H	67	33
I	60	40
J	55	45
K	60	40
AVERAGE	66%	34%

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EXHIBIT III-5

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OBSERVATIONS ON DERIVED MARKET SIZE, 1978:

TELETYPE COMPATIBLE CRT TERMINALS

- "DUMB-PLUS" (CLASS IH) LARGEST CATEGORY

- MOST OF BOTTOM END SALES (CLASS IL) BY ONE
  VENDOR

- MUCH MORE COMPETITION AT SMART END

- SOME FOREIGN SALES INCLUDED

  - UP TO 10% OF INDEPENDENTS

  - GREATER PERCENTAGE OF MINI
    MANUFACTURERS (DIGITAL EQUIPMENT
    CORP., DATA GENERAL, AND HEWLETT-
    PACKARD)

  - IMPACT OF THESE VARIATIONS DOES NOT
    SERIOUSLY BIAS THE DATA TRENDS

EXHIBIT III-6

DERIVED MARKET SIZE, 1978:

TELETYPE COMPATIBLE CRT TERMINALS

CATEGORY	CAPABILITY LEVEL			TOTAL
	IL	IH	2/3	
UNIT SHIPMENTS BY RESPONDENT	31,000	73,500	72,200	176,700
ESTIMATED UNIT SHIPMENTS BY NON-RESPONDENTS	3,000 (3,000)	64,000 (16,000)	47,000 (15,000)	114,000 (34,000)
TOTAL	34,000 (34,000)	137,500 (89,500)	119,200 (87,200)	290,700 (210,700)

( ) = NO ALLOWANCE FOR DIGITAL EQUIPMENT CORP., DATA
GENERAL, AND HEWLETT-PACKARD

EXHIBIT III-7

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COMMENTS ON DERIVED MARKET SIZE, 1979:

TELETYPE COMPATIBLE CRT TERMINALS

- OPTIMISTIC PROJECTIONS

- NO ALLOWANCE FOR PARTS SHORTAGES,
  PRODUCTION DELAYS

- AT LEAST TWO LARGE VENDORS ADMIT "SLIGHTLY
  BEHIND TARGET"

- STRONG DECLINE AT VERY DUMB END

- MUCH DEPENDS ON WHICH NEW MODELS ARE
  INTRODUCED AT NCC IN JUNE

- COULD REACH ALMOST HALF MILLION TERMINALS
  IN 1979

- Projections are target figures, not firm orders (which were considered confidential by most companies.)

- The use of new technology in current models has caused production delays of 60 days or more for several vendors. These may or may not be made up by year end.

• The methodology for Exhibit III-8 is the same as for the corresponding exhibits for 1977 and 1978.

• The next seven exhibits relate to growth trends. Exhibit III-9 shows a differential in growth rates from a low of 15% for class IL to a high of about 100% for segments of class IH and 2/3.

- The overall growth rate (calculated on the basis of units, not revenues) exceeds 50% from 1977-1978.

• Respondent opinion only partially reflects this growth rate, as seen in Exhibit III-10.

- However, some respondents experienced a higher growth rate in units than in revenues, reflecting the relative drop in unit prices for low end terminals from 1977-1978.

- Revenue growth was calculated by INPUT from published annual reports of several respondents.

- Note that these are gross revenues, not profits or sales margins.

• From 1978 to 1979, class IL is projected to show a decrease in the number of units produced, even though there is a new product entry in this class (Perkin-Elmer "Bantam" 550) - see Exhibit III-11.

EXHIBIT III-8

DERIVED MARKET SIZE, 1979:

TELETYPE COMPATIBLE CRT TERMINALS

CATEGORY	CAPABILITY LEVEL			TOTAL
	IL	IH	2/3	
UNIT SHIPMENTS BY RESPONDENTS	18,000	127,000	141,000	286,000
ESTIMATED UNIT SHIPMENTS BY NON-RESPONDENTS	9,000 (9,000)	58,000 (23,000)	99,000 (19,000)	166,000 (51,000)
TOTAL	27,000 (27,000)	185,000 (150,000)	240,000 (160,000)	452,000 (337,000)

( ) = NO ALLOWANCE FOR DIGITAL EQUIPMENT CORP., DATA
       GENERAL, AND HEWLETT-PACKARD

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EXHIBIT III-9

DERIVED MARKET GROWTH, 1977-1978:

TELETYPE COMPATIBLE CRT TERMINALS

CATEGORY	PERCENT CAPABILITY LEVEL			TOTAL
	IL	IH	2/3	
UNIT SHIPMENTS BY RESPONDENTS	14.8%	104.1%	50.4%	59.1%
ESTIMATED UNIT SHIPMENTS BY NON-RESPONDENTS	∞	18.5 (14.2)	95.8 (87.5)	46.1 (54.5)
TOTAL	25.9% (25.9%)	52.7% (79.0%)	65.5% (55.7%)	53.8% (58.4%)
	46.5% (60.3%)			

( ) = NO ALLOWANCE FOR DIGITAL EQUIPMENT CORP., DATA GENERAL, AND HEWLETT-PACKARD

EXHIBIT III-10

RESPONDENT OPINION OF GROWTH, 1977-1978

RESPONDENT	UNITS (%)	REVENUES (%)
A	N/C	–
B	+35-50%	–
C	+25	+81%*
D	+15-25	+15-25
E	+30-40	+49*
F	LESS	LESS
G	+40% MIN.	+40*
H	+50	+18*
I	+30-40	+31*
J	+20	–
K	+30	+38
AVERAGE	+30-36%	39%*

N/C = NOT CALCULATED, STATISTICALLY
       MEANINGLESS
*   = COMPUTED BY INPUT

EXHIBIT III-11

DERIVED MARKET GROWTH, 1978-1979:

TELETYPE COMPATIBLE CRT TERMINALS

CATEGORY	PERCENT CAPABILITY LEVEL			TOTAL
	IL	IH	2/3	
UNIT SHIPMENTS BY RESPONDENTS	-41.9%**	72.7%	95.2%	61.8%
ESTIMATED UNIT SHIPMENTS BY NON-RESPONDENTS	200.0 (200.0)	-9.3** (43.7)	110.6 (26.6)	45.6 (50.0)
TOTAL	-20.5%** (-20.5%)** 23.6% (43.3%)	34.5% (67.5%)	101.3% (83.4%)	55.4% (59.9%)

( ) = NO ALLOWANCE FOR DIGITAL EQUIPMENT CORP., DATA GENERAL, AND HEWLETT-PACKARD

** = NEGATIVE GROWTH

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- Again the highest growth is in class 1H and especially in classes 2/3, where it approximates 100%.

- The 200% growth in non-respondent class 1L shipments can be disregarded because it is calculated on a baseline of only 3000 terminals.

- The overall market growth also grows a few points, to 55%.

- It may be doubtful whether individual respondents can actually achieve the over 100% unit growth rate that they are predicting in Exhibit III-12.

    - However, the average growth rate (in units) of 56-60% corresponds to the overall predicted market growth rate.

    - Revenue projections are in the 25% range, reflecting the dropping unit prices mentioned above.

- Exhibit III-13 presents general conclusions by INPUT on market growth trends, while Exhibit III-14 quotes a number of individual respondents on these trends.

    - "Semi-dumb" terminals refers to a model between class 1H and class 2, with less features than a full class 2 but with character insert and delete capability on the line currently being keyed in.

    - "Very smart" terminal refers to a full option class 3 terminal, including multiple pages of memory and programmability by plug-in ROM (for compatibility emulation and specific user functions).

- Exhibit III-15 shows that almost all respondents expect the high 40% growth rate to continue or even accelerate into 1980.

    - Revenue projections continue at the lower 25% level.

EXHIBIT III-12

RESPONDENT OPINION OF GROWTH, 1978-1979

RESPONDENT	UNITS (%)	REVENUES (%)
A	+162%	-
B	+50	-
C	+71	-
D	+15-25	+15-25%
E	+30-40	-
F	+25	+20
G	+40% MIN.	+25% MIN.
H	+45	+25
I	+110-125	-
J	+15-20	-
K	+50	+30-40
AVERAGE	+56-60%	-

EXHIBIT III-13

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COMMENTS ON DERIVED MARKET GROWTH:

TELETYPE COMPATIBLE CRT TERMINALS

- TOTAL GROWTH RATE IN UNITS REFLECTS DROPPING PRICES, INCREASED VOLUME TO MAINTAIN 25% REVENUE GROWTH

- VERY APPARENT SHIFT TO LEVEL IH AND 2/3 CAPABILITIES, ESPECIALLY 1978-1979

- SHIFT INVOLVES MINI MAKERS AS WELL AS INDEPENDENTS

- FREQUENT COMMENT: "ADVANCED FUNCTIONS ARE ON THE CHIP, MIGHT AS WELL FEATURE THEM."

EXHIBIT III-14

RESPONDENT COMMENTS ON GROWTH TRENDS

- "TREND TOWARD SMARTER END, PRICE DROPPING."

- "EDITING TERMINALS WILL BE REPLACED BY VERY SMART OR SEMI-DUMB TERMINALS."

- "SMARTER TERMINALS ARE NOT NEEDED OR DESIRED IN MANY SITUATIONS BECAUSE THE EXTRA KEYS AND EXTRA FUNCTIONS CONFUSE THE OPERATORS."

- "WILL BE MAINLY EDITING TERMINALS BECAUSE ADDITIONAL FUNCTIONS ARE SO CHEAP."

- "END USER MARKET IS GROWING BECAUSE OVERHEAD INVEST-MENT (SOFTWARE, DATA COMMUNICATIONS) HAS ALL BEEN ABSORBED. OEM MARKET IS GROWING BECAUSE LOWER COSTS ALLOW INTRODUCTION OF TERMINALS TO SMALLER ENVIRONMENTS (DOCTOR'S OFFICES, ETC.)."

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EXHIBIT III-15

RESPONDENT OPINION OF GROWTH, 1980

RESPONDENT	UNITS (%)	REVENUES (%)
A	+40-50%	–
B	+50	–
C	+15	–
D	+40-50	–
E	+30-40	–
F	+30-40	+20%
G	+40% MIN.	+25% MIN.
H	+30-40	+25
I	+30-40	–
J	+25	–
K	+50	–
AVERAGE	+34%-40%	–

- Based on the best information available to INPUT, Exhibit III-16 defines three ranks of vendors according to the number of Teletype compatible CRT terminals shipped.

  - The top rank represents 40,000 or more terminals shipped by each vendor in 1978.

  - The second rank represents approximately 18,000-25,000 terminals shipped by each vendor in 1978.

  - The third rank represents approximately 5,000-15,000 terminals shipped by each vendor in 1978.

  - A fourth rank would include all the other (smaller) manufacturers of Teletype compatible CRT terminals.

- Respondents were asked to rank each other in terms of number of units shipped, and the results are shown in Exhibit III-17.

  - With few exceptions, these rankings agree with INPUT's ranking.

- Respondents were also asked to estimate the number of units shipped in 1978 by each of the other companies, and their answers are shown in Exhibit III-18.

  - No conclusion should be drawn that the presence, absence, or specificity of a particular answer identifies a specific respondent, since INPUT has shuffled the identities to preserve confidentiality.

- Exhibit III-19 is INPUT's summary and estimates of the installed base and shipments of Teletype compatible CRT terminals by vendor, by model, by class of terminal, by calendar year.

  - These figures are a compilation from several sources of the best information available to INPUT.

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EXHIBIT III-16

VENDOR RANK

- ADDS, LEAR-SIEGLER, AND DIGITAL EQUIPMENT CORP.

- HAZELTINE, HEWLETT-PACKARD, PERKIN-ELMER, DATA GENERAL

- BEEHIVE, INFOTON, SOROC, TEC, TELERAY

EXHIBIT III-17

RESPONDENT OPINION OF VENDOR RANK

VENDOR	RESPONDENT											AVER-AGE (%)
	A	B	C	D	E	F	G	H	I	J	K	
ANN ARBOR	–	–	–	–	–	9	–	–	–	–	10	9.5%
ADDS	1	3	3	1-2	1	3	4-5	1-2	1	3	1	2.1
BEEHIVE	5	4	–	4-5	5-6	5	7	5	–	5	6	5.2
DATA GENERAL	–	–	–	–	9-10	–	2-3	–	4	–	–	5.3
DEC	–	–	–	–	4	–	1	4	3	–	–	3.0
HAZELTINE	3	2	1	3	3	2	6	3	2	2	4	2.8
HEWLETT-PACKARD	–	–	–	=	–	–	2-3	–	–	–	–	2.5
INFOTON	6	5-7	5	–	5-6	7	–	7	–	6	3	5.6
LEAR-SIEGLER	2	1	2	1-2	2	1	4-5	1-2	5	1	2	2.1
PERKIN-ELMER	4	5-7	4	4-5	7-8	4	–	6	–	4	5	5.0
SOROC	–	8	–	–	9-10	8	–	8	–	–	9	8.5
TEC	–	5-7	6	–	7-8	6	–	9	–	7	7	6.8
TELERAY	–	–	–	–	–	–	–	–	–	–	8	8.0

(MENTIONED) = TELETYPE, INTERTEC, EECO, DATAMEDIA

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EXHIBIT III-18

RESPONDENT OPINION OF TOTAL 1978 SHIPMENTS (000 UNITS)

RESPONDENT

VENDOR	A	B	C	D	E	F	G	H	I	J	K
ANN ARBOR	·	·	·	·	·	5	·	"MINOR"	·	·	**
ADDS	45	*	*	30-40	45	30	40	"30% SHARE"	"15% SHARE"	*	40
BEEHIVE	10	40(?)	·	**	10	16	10	"VARIABLE"	***	**	*
DATA GENERAL	·	(1)	·	(1)	2-3	·	40+	"A LOT"(1)	*	"A COMER"	·
DEC	·	(1)	"SOME"	(1)	25	·	40+	"A LOT"	*	*	·
HAZELTINE	30	"UP THERE"	*	*	30	30	20-30	·	*	·	*
HEWLETT-PACKARD	·	·	·	(1)	·	·	40+	"STRONG COMPETI-TORS"	·	**	·
INFOTON	8-10	**	12-15	·	10	10	·	·	·	*	*
LEAR-SIEGLER	40-45	36	*	30-40	40	40	40	"30% SHARE"	*	*	40
PERKIN-ELMER	12-15	**	12-15	**	5	18	"NOT MUCH"	(1)	·	**	*
SOROC	"GROW-ING"	16	***	·	2-3	5	·	6-7	***	·	**
TEC	"SOME"	**	12-15	·	5	16	·	"A FEW"	·	**	**
TELERAY	"PLUG-GING ALONG"	·	***	·	·	·	·	·	·	·	**
TELETYPE	·	·	·	(1)	·	·	·	"A LOT"	·	·	·
TOTAL	145-155	·	·	·	174-176	165	230-240+	·	·	·	·

*"TOP TIER"　　　***"NOISE LEVEL"
**"SECOND TIER"　　(1) "NOT MUCH OUTSIDE OWN CAPTIVE MARKET"

EXHIBIT III-19

TELETYPE COMPATIBLE CRT TERMINALS:

INSTALLED BASE AND SHIPMENTS, 1977-1979

MAKE	MODEL	12/78 BASE (000 UNITS)	SHIPMENTS (000 UNITS)											
			1977				1978				1979			
			IL	IH	2/3	T	IL	IH	2/3	T	IL	IH	2/3	T
ANN ARBOR	400	2.0							2.0	2.0			4.0	4.0
	OTHERS	15.0		2.0	2.0	4.0			4.0	4.0			4.0	4.0
ADDS	REGENT 100	20.0		2.0		2.0		18.0		18.0		25.0		25.0
	REGENT 200	9.0			.5	.5			7.0	7.0			12.0	12.0
	CONSUL 5XX	45.0	8.0	10.0		18.0	9.0	11.0		20.0		25.0		25.0
	CONSUL 9XX	20.0			9.0	9.0								
BEEHIVE	MINIBEE	10.0	4.0			4.0								
	B150/152	8.0		4.0		4.0								
	MICRO B/B1							6.0		6.0		7.0		7.0
	MICRO B2												6.0	6.0
	OTHERS	10.0			4.0	4.0			4.5	4.5				
DATA GENERAL	6052/3	35.0		15.0		15.0		18.0		18.0		25.0		25.0
DEC	VT50/52	100.0		25.0		25.0		30.0		30.0		10.0		10.0
	VT 100	10.0							10.0	10.0			50.0	50.0
HAZELTINE	1400	5.0					3.0			3.0	9.0			9.0
	1410											3.0		3.0
	1500	28.0		12.0		12.0		16.0		16.0		20.0		20.0
	1510/20	10.0			3.0	3.0			6.0	6.0			8.0	8.0
	2000	23.0												
	MOD 1	5.0			3.0	3.0			3.0	3.0			3.0	3.0
	OTHERS	10.0												
HEWLETT-PACKARD	2621/264X	35.0			16.0	16.0			22.0	22.0			30.0	30.0

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EXHIBIT III-19 (CONTD.)
TELETYPE COMPATIBLE CRT TERMINALS:
INSTALLED BASE AND SHIPMENTS, 1977-1979

MAKE	MODEL	12/78 BASE (000 UNITS)	SHIPMENTS (000 UNITS)											
			1977				1978				1979			
			IL	IH	2/3	T	IL	IH	2/3	T	IL	IH	2/3	T
INFOTON	VISTAR	18.0	1.0	1.0	1.0	3.0								
	100												5.0	5.0
	200	7.0		2.0		2.0		5.0		5.0		5.0		5.0
	400	7.0			2.0	2.0			5.0	5.0			5.0	5.0
LEAR SIEGLER	3A	55.0	12.0	3.0		15.0	20.0	12.0		32.0	6.0	42.0		48.0
	1A/31	18.0			6.0	6.0			9.0	9.0			15.0	15.0
	2/42	7.0			2.0	2.0			3.0	3.0			15.0	15.0
PERKIN-ELMER	550										12.0			12.0
	1100	18.0		8.0		8.0		10.0		10.0		10.0		10.0
	1200	15.0			5.0	5.0			10.0	10.0			12.0	12.0
SOROC	IQ120	20.0			5.0	5.0		15.0		15.0			35.0	35.0
	IQ140								1.2	1.2			7.5	7.5
TEC	70	3.5			1.5	1.5		3.5		3.5			5.0	5.0
	500	8.5						8.5		8.5		11.0		11.0
	4XX	6.0			1.5	1.5								
	OTHERS	6.0		4.0		4.0								
TELERAY	1061	1.0						1.0		1.0			7.0	7.0
	3XXX	9.0	2.0	2.0		4.0	2.0	3.0		5.0		2.0		2.0
	4XXX	1.5			.5	.5			1.0	1.0			1.5	1.5
TELETYPE (NOT INCLUDING DATASPEED)	40/1&2	30.0			10.0	10.0			12.0	12.0			15.0	15.0
TOTALS		630.5	27.0	90.0	72.0	189.0	34.0	137.5	119.2	290.7	27.0	185.0	240.0	452.0

- Model numbers include predecessor or equivalent models if not separately shown.

- The installed base is estimated as of the end of 1978.

- All numbers are in thousands of units.

- The classes (IL, IH, 2/3) are as defined in Appendix A. "T" is the total for this model if it can fall into two classes depending on the options that may be included.

- If a model was introduced near the end of a calendar year, its shipments may be consolidated into the following year.

- Allowances may be made in 1979 under the nearest equivalent model for new models expected, but not yet announced.

- Exhibit III-20 presents INPUT's conclusions as to the trend of features to be offered.

- Quotations from individual respondents on the same subject are shown in Exhibit III-21.

- Exhibit III-22 indicates from the respondents' own comments that many are planning to introduce new models in their product line this year, either to broaden the line or to replace mature products.

- Respondents were asked to estimate, for the industry as a whole and also for their own company, what percentage of CRTs are sold directly to end users and what percentage are sold to OEMs - see Exhibit III-23.

    - In last year's study, another category of "third party," i.e., distributors, was defined. This study combines sales to distributors and OEMs because a shift has occurred in the distribution network.

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EXHIBIT III-20

FEATURE TREND

- STATED: TWO LEVELS = DUMB-PLUS (BETWEEN IH AND TWO) AND VERY SMART

- REASONS:

    - MARGINS BOTTOMED OUT ON LOW END

    - DDP/MULTIFUNCTION REQUIRE MEMORY, EXTENSIVE EDITING

    - PERHAPS GRAPHICS ON TOP END

    - COLOR NOT YET IN DEMAND

- BUT $500 (OEM LARGE QUANTITY PRICE) DUMB TERMINAL STILL ATTRACTIVE TO VOLUME PRODUCER

- HIGH RELIABILITY (FROM LOW CHIP OR COMPONENT COUNT) IMPLIES REPLACEMENT MAINTENANCE BY USER, OR LOCAL SPARES

EXHIBIT III-21

RESPONDENT COMMENTS ON FEATURES SHIPPED

- "DUMB TERMINALS 90% LOADED, i.e., WITH NUMERIC KEYPAD. SMART TERMINALS ARE MAINLY LOADED, WITH TABULATION AND EDITING. DETACHED KEYBOARD COSTS TOO MUCH. PEOPLE WON'T PAY $100 FOR THE OPTION."

- "INFORMATION NOT AVAILABLE."

- "NO COMMENT."

- "CONFIDENTIAL."

- "MOST FEATURES ARE STANDARD."

- "DUMB TERMINALS ARE MOSTLY THE BASIC MODEL. SMART TERMINALS MAINLY GO OUT WITH POLLING/ADDRESSING. ABOUT HALF THE FORMER OPTIONS ARE NOW STANDARD, e.g., UPPER/LOWER CASE, NUMERIC KEYPAD, PORT."

- "TOP OF THE LINE MODEL HAS ALL FEATURES AS STANDARD EQUIPMENT. BOTTOM OF THE LINE HAS MANY OPTIONS BUILT IN. DON'T KNOW WHAT PERCENTAGE GO OUT WITH EXTRA FEATURES."

- "MOST (ELECTRONIC) FEATURES ARE STANDARD. SOME TERMINALS GO OUT WITH COSMETIC OPTIONS."

- "NEW MODELS HAVE MANY FORMER OPTIONS AS STANDARD FEATURES. ABOUT THE ONLY OPTIONS NOW ARE THE EMULATION FEATURES."

- "OUR SHIPMENTS ARE CONFIDENTIAL. BUT MOST HAVE EDITING AND BLOCK TRANSMISSION BUILT IN. MANY MANUFACTURERS ADVERTISE 'FEATURES' THAT ARE OF MARGINAL VALUE, SUCH AS CHANGEABLE CHARACTER FONTS AND SO FORTH. WE DON'T DO THAT."

- "MOST FEATURES ARE STANDARD, BUT PLENTY OF OPTIONS ARE AVAILABLE."

EXHIBIT III-22

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RESPONDENT COMMENTS ON NEW PRODUCTS

- "NEW DUMB LEVEL TERMINAL, SECOND QUARTER ANNOUNCEMENT."

- "YES, THERE WILL BE."

- "A VERY SMART MODEL AND A LEVEL 1½ MODEL WITH OPTIONAL BLOCK/
  CHARACTER TRANSMISSION AND CHARACTER INSERT/DELETE, BUT
  NO UNNECESSARY FEATURES."

- "YES, BOTH AT SMART END AND DUMB END."

- "NO IMMINENT ANNOUNCEMENTS, BUT WILL CERTAINLY STAY
  COMPETITIVE."

- "YES, AT LEAST A VERY SMART TERMINAL WITH PAGING; MAYBE
  OTHER MODELS AS WELL."

- "NO, NOTHING THIS YEAR."

- "A MODEL BETWEEN THE DUMB AND SMART END, WITH MOST OF THE
  SMART FEATURES BUT CLOSE TO THE DUMB PRICE."

- YES, WE WILL HAVE SOME ANNOUNCEMENTS."

- "THERE ARE ALWAYS NEW PRODUCTS IN THE WORKS."

- "YES, EXTENDED MEMORY TO REPLACE (EXISTING HIGH LEVEL MODEL),
  PLUS SEVERAL EMULATORS: VT-52, DASHER, OTHERS."

EXHIBIT III-23

RESPONDENT OPINION OF OEM/END USER SALES RATIO

RESPON-DENT	FOR THE INDUSTRY		FOR OUR OWN COMPANY	
	PERCENT OEM	PERCENT END USER	PERCENT OEM	PERCENT END USER
A	N/C	N/C	N/C	N/C
B	N/C	N/C	N/C	N/C
C	75	25	N/C	"MOST"
D	N/C	N/C	50	50
E	N/C	N/C	N/C	N/C
F	75	25	N/C	N/C
G	75	25	N/C	N/C
H	90	10	90	10
I	75	25	90	10
J	75	25	90	10
K	75	25	45	55
AVERAGE	77%	23%	75%	25%

N/C = NO COMMENT

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- Most vendors now discourage small quantity sales, either to end users or to small systems houses. These customers are referred instead to distributors.

- Small (non-stocking) distributors in turn may purchase from large distributors who maintain an inventory, and who may compete with the manufacturer's own salesmen for certain sizes of orders.

- Consequently several respondents now report 90% of their sales are in the OEM category, and only 10% directly to end users such as universities, government agencies, or large corporations.

- Exhibit III-24 indicates that most respondents consider an OEM discount of 10-35% to be normal for the industry.

  - They do not agree on the breakpoints, nor do their own discounts necessarily follow this pattern.

  - Most agree that large quantities are subject to a negotiated discount that can include other factors in addition to price (i.e., schedule, service, customization, etc.).

- Large manufacturers tend to offer all modes of maintenance, while smaller manufacturers look to other techniques than their own maintenance contracts, as shown in Exhibit III-25.

  - Quotations from individual respondents (identities shuffled) are shown in Exhibit III-26.

EXHIBIT III-24

RESPONDENT OPINION OF OEM DISCOUNT

RESPONDENT	FOR THE INDUSTRY	FOR THE RESPONDENT
A	10% @25 UNITS RISING TO 35% @500 UNITS	10% @25 UNITS, 30% @100 UNITS, FACTORY QUOTE ABOVE THAT
B	10% @25 UNITS RISING TO 38% @500 UNITS	10% @25 UNITS RISING TO 30-35% @500 UNITS
C	N/C	ABOUT THE SAME
D	35% @100 UNITS, 37% @500 UNITS	A LITTLE HIGHER
E	N/C	MEANINGLESS QUESTION FOR SYSTEMS MANU-FACTURER. DISCOUNT DEPENDS ON NUMBER OF SYSTEMS, NOT NUMBER OF TERMINALS
F	10% @25 UNITS RISING TO 35% @500 UNITS	SAME, PEAKING AT 300 UNITS
G	N/C	MOSTLY NEGOTIATED PRICE
H	N/C	OEM DISCOUNT, BUT NOT BASED ON QUANTITY
I	25% @26 UNITS, 30-35% @101 UNITS, 37% @501 UNITS, NEGOTIATED ABOVE 1,000 UNITS	CONFIDENTIAL
J	10% @26 UNITS, 15% @51 UNITS, 18% @101 UNITS, 30% @501 UNITS	ABOUT THE SAME
K	10% to 30%	20-25% @51-100 UNITS, NEGOTIATED ABOVE THAT

N/C = NO COMMENT

INPUT

EXHIBIT III-25

RESPONDENT COMMENTS ON SALE OF MAINTENANCE CONTRACTS

RESPONDENT	COMMENT
A	FEW.
B	10-20% OF OEM SALES.
C	RELY ON DISTRIBUTOR NETWORK FOR MAINTENANCE
D	VERY LITTLE NOW, LOOKING TO EXPAND THIS AREA.
E	ALMOST NONE NOW, BUT WILL BEGIN THIS YEAR VIA A THIRD PARTY.
F	A FAIR NUMBER.
G	SOME OEM SALES.
H	MOST OEM SALES, CONFIDENTIAL AS TO END USER SALES.
I	NOT A PROBLEM BECAUSE ALL ALTERNATIVES ARE OFFERED - OWN MAINTENANCE, CONTRACT MAINTENANCE, DEPOT MAINTENANCE, THIRD PARTY MAINTENANCE.
J	40% OF OEM SALES; 10% AS FIELD SERVICE AND 30% AS DEPOT SERVICE.
K	MOST END USERS TAKE NINE MONTH EXTENDED WARRANTY FOR $60.

EXHIBIT III-26

RESPONDENT COMMENTS ON MAINTENANCE:

DO OEM SALES PRECLUDE SALES OF MAINTENANCE CONTRACTS?

- "OEM SALES PROBABLY INHIBIT SALES OF MAINTENANCE CONTRACTS. WE WOULD LIKE TO SELL MORE MAINTENANCE OURSELVES BUT THE LARGE DISTRIBUTORS DO IT ALL THEMSELVES."

- "YES TO SOME EXTENT, ALTHOUGH LARGE END USERS WHO ARE LIKE OEM'S IN THE QUANTITIES THEY BUY COME TO US FOR MAINTENANCE. LARGE OEM CUSTOMERS DO THEIR OWN SERVICE, BUT SMALL OEM CUSTOMERS COME TO US."

- "PROBABLY FOR 'ON-CALL' FIELD MAINTENANCE, WHICH IS EASIER AND BETTER FOR THE OEM/DISTRIBUTOR TO OFFER HIMSELF; BUT DEPOT-TYPE MAINTENANCE WILL HOPEFULLY BE MORE ATTRACTIVE TO OEM'S".

- "SOMEWHAT. LARGE OEM'S AND DISTRIBUTORS WANT TO DO IT THEM-SELVES. WE ARE NOT ESPECIALLY INTERESTED IN MAINTENANCE CONTRACTS; T&M (TIME AND MATERIALS) IS SATISFACTORY. IF THERE WERE A BROADER PRODUCT LINE (IN ADDITION TO TERMINALS), IT COULD BE MORE PROFITABLE; BUT IT IS STILL IMPORTANT TO BE ABLE TO OFFER MAINTENANCE WHEN MAKING THE SALE."

- "NOT A PROBLEM FOR US BECAUSE WE OFFER ALL ALTERNATIVES - CUSTOMER'S OWN MAINTENANCE, CONTRACT MAINTENANCE, DEPOT, AND THIRD PARTY."

- "FOR SMALLER OEM'S (SYSTEMS HOUSES, ETC.), THE REASON THEY BUY FROM A MAJOR SYSTEMS MANUFACTURER IS TO ASSURE SINGLE SOURCE MAINTENANCE, EVEN THOUGH A COMPONENT MANUFACTURER SUCH AS (DELETED) MAY SELL TERMINALS CHEAPER."

EXHIBIT III-26 (CONTD.)

RESPONDENT COMMENTS ON MAINTENANCE:

DO OEM SALES PRECLUDE SALES OF MAINTENANCE CONTRACTS?

- "ON OUR LOWEST PRICE MODEL, IT IS CHEAPER TO BUY TWO SPARES PER 25 ORDER AND SHIP THE DEFECTIVE TERMINAL BACK FOR REPAIR WHEN NEEDED. LARGER OEM'S TAKE OVER THE MAINTENANCE FUNCTION THEMSELVES ANYWAY."

- "WE OFFER A FIXED COST PER INCIDENT MAINTENANCE ON A TELEPHONE/ MAIL-IN BASIS (PLUG REPLACEABLE MODULES, STANDARD $70 CHARGE FOR ANY MODULE.) AS A RESULT WE ARE GRADUALLY CLOSING OUT OUR FRANCHISED SERVICE NETWORK."

- "FOR SMALL COMPANIES LIKE US, YES. BUT MAINTENANCE IS APPARENTLY PROFITABLE FOR THE LARGE COMPANIES WHO DO IT."

- "WE CAN HANDLE ALL METHODS."

- "DEFINITELY, MOST OEM SALES ARE INCORPORATED INTO SYSTEMS WHICH ARE MAINTAINED BY THE SYSTEM VENDOR OR A THIRD PARTY. BUT THEIR 'MAINTENANCE' IS USUALLY BY REPLACEMENT, SO EVEN- TUALLY ABOUT 50% OF THE PRODUCTS COME BACK TO THE FACTORY FOR TIME AND MATERIALS MAINTENANCE, WHICH IS PROFITABLE AND PREDICTABLE, BUT YOU DON'T HAVE THE MONEY UP FRONT."

APPENDIX A: DEFINITIONS

APPENDIX A: DEFINITIONS

I.   RESPONDENTS

- All of the major manufacturers of Teletype compatible CRT terminals were contacted during the course of this study, and almost all furnished some information.

- However, the systems manufacturers (Digital Equipment Corporation, Data General, and Hewlett-Packard) cited company policy prohibiting disclosure of shipment and pricing data, as did Teletype Corporation.

- In addition, Hazeltine was unable to participate during the time frame of the study.

- A group of smaller manufacturers (shipments mainly under 5,000 units/year) were not contacted.

- On the basis of information available to INPUT (from other vendors, industry observers, and related studies done by INPUT) shipments for this group of companies were estimated and included in the market size exhibits under the heading, "Estimated Unit Shipments By Non-Respondents."

- These estimates are presented both as an aggregate number, and as a number in parentheses which is an estimate of that portion of the shipments that were produced by all non-respondents <u>except</u> Digital Equipment Corporation, Data General, and Hewlett-Packard.

2. CAPABILITY LEVEL OF CRT TERMINALS

- Using definitions supplied by IBM, three classes of CRT terminals were analyzed.

- Classes IL and IH are both "dumb," or "conversational" terminals.

  - Character oriented.

  - No editing capability.

- Class IH differs in that it includes some human engineering features, such as a numeric keypad or detachable keyboard.

- Classes 2 and 3 are combined for the purpose of this analysis.

  - Both are "smart."

  - Both have editing capabilities, either by character or by line.

  - Both have block transmission capability.

  - Class 3 has paging capability.

  - Other options, such as polling and addressing, may be available.

3. MODEL NUMBERS

- For the purpose of this study, and as defined by IBM, class IL includes:

- ADDS Consul 5XX series (some models).

- Beehive Minibee.

- Hazeltine 1400.

- Infoton Vistar (some models).

- Lear Siegler ADM-3A (basic model).

- Perkin-Elmer Bantam 550.

- Teleray 3XXX series (some models).

● Class IH includes:

- Ann Arbor (some models).

- ADDS Regent 100.

- ADDS Consul 5XX series (some models).

- Beehive B150/B152.

- Beehive Micro B/B1.

- Data General Dasher 6052/6053.

- DEC VT-50/VT-52.

- Hazeltine 1410.

- Hazeltine 1500.

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- Infoton Vistar (some models).

- Infoton I-200.

- Lear Siegler ADM-3A (with options).

- Perkin-Elmer 1100.

- TEC 500.

- TEC (other models).

- Teleray 3XXX series (some models).

- Classes 2/3 include:

- Ann Arbor 400.

- Ann Arbor (other models).

- ADDS Regent 200.

- ADDS Consul 9XX series (some models).

- Beehive Micro B2.

- Beehive (other models).

- DEC VT-100.

- Hazeltine 1510/1520.

- Hazeltine Modular One.

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- Hewlett-Packard (all models).

- Infoton Vistar (some models).

- Infoton I-100.

- Infoton I-400.

- Lear Siegler ADM-1A/31.

- Lear Siegler ADM-2/42.

- Perkin-Elmer Owl 1200.

- Soroc IQ120/IQ140.

- TEC 70.

- TEC 4XX series.

- Teleray 4XXX series.

- Teletype 40/1, 40/2.

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APPENDIX B: QUESTIONNAIRE

CRT TERMINAL SHIPMENTS

VENDOR QUESTIONNAIRE

INPUT is currently doing a study of the CRT teletype compatible, ASCII
asynchronous terminal market growth in the U.S. We would like to share
our thinking with you and elicit your opinions as to the size of the
market and the types of terminal features that are becoming important.
After the study is completed, we would like to send you a summary of
the salient results. Please note that while this is a confidential
summary, we do not want any data that are proprietary to your organiza-
tion. Data should cover U.S. production shipped to U.S. orders: no
international shipments or orders.

DEFINITIONS: For the purpose of this study, we distinguish three
levels of intelligence.

- Level 1 (Low) - Dumb terminal, no special features except
  a printer port and/or a standard interface (current loop,
  RS232C, or both). Includes ADM-3A, Hazeltine 1400,
  Perkin-Elmer Bantam.
- Level 1 (High) - Dumb terminal, but also includes
  feature(s) such as a numeric keypad, a separate keyboard,
  a standard interface (current loop, RS232C, or both).
  Includes ADDS Regent 100, Beehive 150-1, Hazeltine 1500,
  Infoton 100 and 200, and Perkin-Elmer 1100 (Fox).
- Level 2 and 3 - Smart terminals, block oriented with
  full editing, formatting, paging, and other features,
  but not including programmability. Includes Regent 200,
  Beehive 150-2 & 550. Hazeltine 1510 & 1520 & Modular 1,
  Infoton 400, ADM-1A & 2 & 31, Perkin-Elmer 1200 (owl).

Using these definitions, how would you classify your models:

MODEL NO.   CLASS   COMMENTS

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1. CHARACTERISTICS OF CRT TTY-COMPATIBLE MARKET IN 1977 by consensus of the major vendors were that 130,000 terminals were shipped, of which 100,000 (77%) were OEM sales to Systems Houses, Leasing Companies, Mini Manufacturers, etc., and 30,000 (23%) were sales to end users. How do you think that market changed in 1978?

2. INPUT has figures which show these shipments in 1978. What is your opinion?

<u>Respondent Opinion</u>

Level 1L: _____units

Level 1H: _____units

Level 2 & 3: _____units

3. Who would you rank as the top 10 CRT producers, and what do you feel is their market share/no. of units shipped?

Rank	Company	Model	Share	Base	Shipments	%OEM	% End User
	ANN ARBOR	400					
	ADDS	Regent 100					
		Regent 200					
	BEEHIVE	150-1					
		150-2					
		550					
		Microbee					
	DATA GENERAL	6052					
		6053					
	DEC	VT-52					
		VT-100					
		VT-62					
	HAZELTINE	1400					
		1410					
		1500					
		1520					
		Mod 1					
	HEWLETT-PACKARD	2621A					
		2640B					
		2645A					

Rank	Company	Model	Share	Base	Shipments	%OEM	% End User
	HONEYWELL (INCOTERM)	7200 7800					
	INFOTON	100 200 400					
	LEAR-SIEGLER	ADM-3A ADM-1A ADM-2 ADM-31 ADM-42					
	PERKIN-ELMER	550 1100 1200					
	SOROC	IQ120 IQ140					
	TEC	70 500					
	TELRAY	3741 1061 4041					
	TELETYPE (DATASPEED)	40/1 40/2					
	TEXAS INSTR.	912					

4A.   How many CRTs did you ship in 1978?

MODEL	UNITS	BASIC/OPTIONS	BASE

4B.   What % change was this over your 1977 shipments? (Same for all models? If not, describe.)

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4C.   What are your 1979 projections?

MODEL   FIRM ORDERS(BACKLOG)   TOTAL PROJECTION

4D.   What is the trend for 1980? ___% increase (separately by level
       if necessary).

4E.   Do you plan to introduce a new level product this year?
       Please discuss.

5A.   What were your shipment characteristics by order size? Please
       discuss separately for OEM sales and End User sales.

	ORDER/SHIPMENT SIZE				
	1-25	26-50	51-100	101-500	501+

OEM SALES

END USER SALES

5B.   What discounts are associated with these size breaks?

INDUSTRY NORM	___%	___%	___%	___%	___%
YOUR SCHEDULE	___%	___%	___%	___%	___%

5C. Is the normal time period: ___12 mos.   ___18 mos.   ___mos.

6A. What percentage of your CRTs are sold with a maintenance contract?

	Total	+	Field Service	+	Depot Service
OEM SALES	___%		___%		___%
END USER SALES	___%		___%		___%

6B.   Do OEM sales preclude sales of maintenance contracts?

Thank you for your participation.

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